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Foods including potatoes, rice, fruit and vegetables, olive oil, cocoa, and coffee hit by extreme weather that exceeded historical precedent, raising prices for consumers and posing wider societal risks



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"Until we get to net-zero emissions, extreme weather will only get worse, and it's already damaging crops and pushing up the price of food all over the world," said Maximilian Kotz, BSC researcher and lead author of the study.

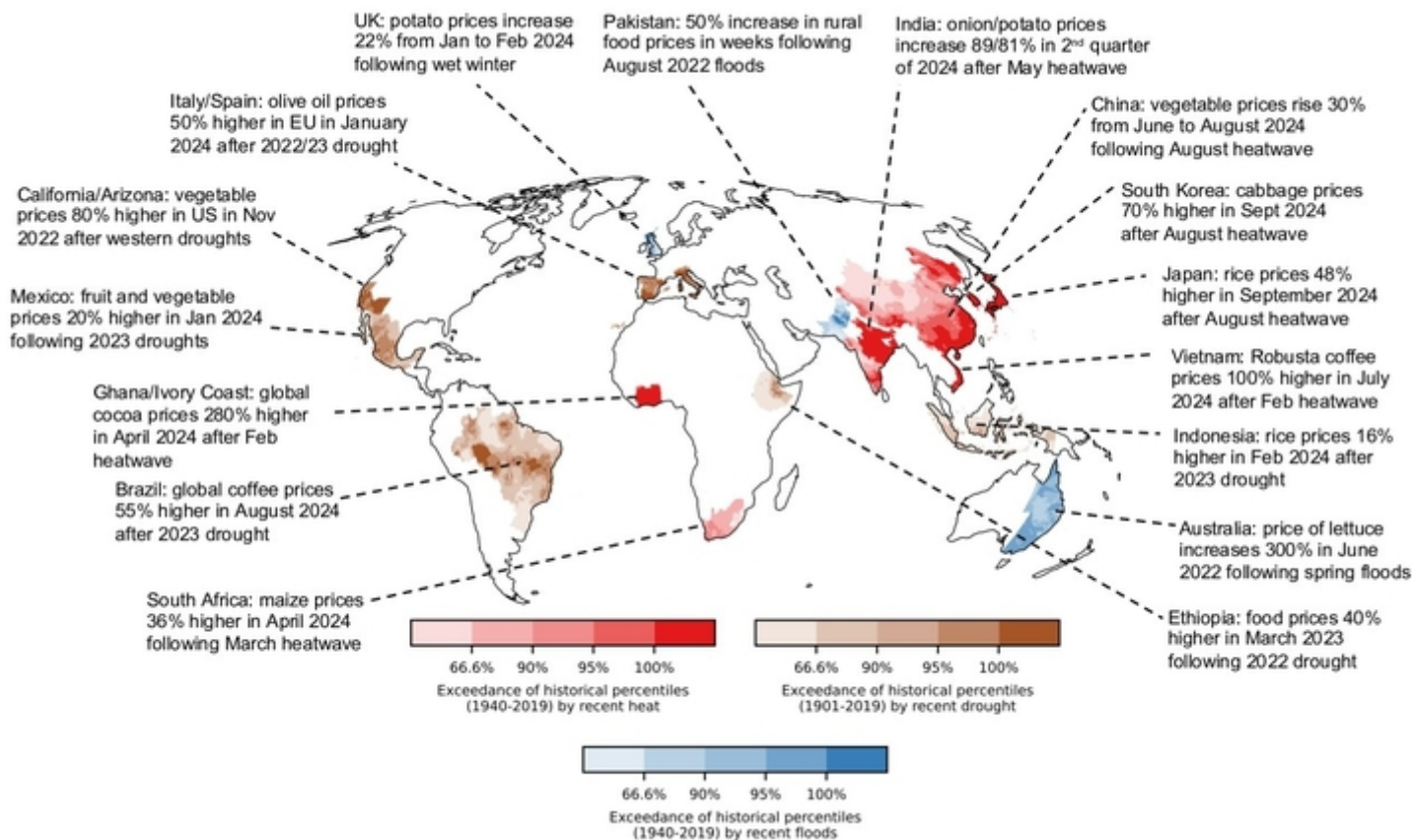
British potatoes, Californian vegetables, South African maize and Indian onions are among many foods affected by recent price shocks driven by weather extremes, according to a team of international scientists.

The [study](#), led by Maximillian Kotz of the Barcelona Supercomputing Center-Centro Nacional de Supercomputación (BSC-CNS), investigated 16 examples across 18 countries over a two-year period (2022-

2024), where price spikes were associated with extreme heat, drought or heavy precipitation events, many of which were so extreme they exceeded all historical precedent prior to 2020.

Among these examples:

- In the UK, potato prices increased 22% (from Jan to Feb 2024) following extreme winter rainfall that scientists [said](#) was made 20% heavier and 10 times more likely by climate change.
- In California and Arizona in the United States, vegetable prices increased 80% in November 2022 after the extreme summer drought in western states, which [faced](#) water shortages, extreme heat, and soil moisture drought conditions throughout the summer of 2022.
- In Ethiopia, food prices were 40% higher in March 2023 following the 2022 drought in the Horn of Africa, the worst in 40 years, which scientists [said](#) was made "much stronger" and "about 100 times more likely" by climate change.
- In Spain and Italy, the [2022-2023 drought in southern Europe](#), for which scientists [said](#) "global warming contributed for more than 30% of the (2022 summer) drought intensity and its spatial extent via enhanced evaporation", drove an increase in the price of olive oil of 50% year-on-year across the EU by January 2024, on top of price increases the previous year. Spain produces over two fifths of the world's olive oil.
- Global cocoa prices were almost 300% (280%) higher in April 2024 following the heatwave in Ivory Coast and Ghana just two months earlier, which scientists [said](#) was made 4°C hotter by climate change. Together, these two countries account for nearly two thirds (60%) of global cocoa production.
- The global coffee market has also taken serious hits. Brazil is the world's biggest exporter of Arabica, while Vietnam is the biggest exporter of Robusta. Global coffee prices were 55% higher in August 2024 following the 2023 drought in Brazil, which scientists [said](#) was made 10-30 times more likely due to climate change, while Robusta coffee prices were 100% higher in July 2024 following [record-breaking heat](#) a few months earlier in Vietnam and across Asia.
- In India, the price of onions and potatoes jumped by over 80% in the second quarter of 2024 after a heatwave in May, a ["largely unique event"](#) that was made at least 1.5°C warmer by climate change.
- In Japan, rice prices were 48% higher in September 2024 after the August heatwave, as the country [experienced](#) its hottest summer (on a par with 2023) since regional records began in 1946, with summer temperatures 1.76°C higher than average.
- In South Korea, cabbage prices were 70% higher in September 2024 after the August heatwave. The country [experienced](#) its highest average summer time temperature since such records began half a century ago - nearly two degrees higher than the historic average.
- Pakistan experienced a 50% increase in rural food prices in weeks following the [August 2022 floods](#), with monsoon rains 547% above average and record-breaking cumulative weekly rainfall in July (200 mm) on already saturated soils as the pre-monsoon rainfall was 111% higher than the long-term average since 1951.
- In Mexico, fruit and vegetable prices were 20% higher in January 2024 following the 2023 drought, one of the [most severe droughts](#) that Mexico has faced in more than a decade.



[Map of climate impacts on food supplies is also available to download here.](#)

Research by the Food Foundation [shows](#) that, on average, healthy food is twice as expensive per calories as less healthy food. When prices increase, low- income households are likely to cut back on nutritious foods like fruit and vegetables because they can't afford them.

Climate change-induced food price shocks could therefore exacerbate a range of health outcomes, from malnutrition (not getting enough nutrients, which is a particular concern for children whose nutritional needs are higher) to a range of chronic diet-related conditions including coronary heart disease, type 2 diabetes and many cancers. There is also a growing body of evidence connecting food insecurity and poor diets with mental health outcomes.

Maximillian Kotz, Marie-Curie post-doctoral fellow at BSC and lead author of the study, said:

"Until we get to net-zero emissions, extreme weather will only get worse, and it's already damaging crops and pushing up the price of food all over the world.

"People are noticing, with [rising food prices](#) number two on [the list of climate impacts](#) they see in their lives, second only to extreme heat itself.

"Sadly, when the price of food shoots up, low-income families often have to resort to less nutritious, cheaper foods. Diets like this have been linked to a range of health conditions like cancer, diabetes and heart disease."

Central bank mandates for controlling inflation may become harder to deliver as increasingly extreme weather makes food prices more volatile domestically and in global markets.

The research comes ahead of the [UN Food Systems Summit Stocktake](#) on Sunday 27 July, where world leaders will meet to discuss threats to the global food system. The event is co-hosted by Ethiopia and Italy, both of whom have been hit by climate change-induced food price shocks and are featured in the study.

When it comes to the UK, potatoes aren't the only British-grown commodity affected by climate change. Cereals, onions, sugar beet, cauliflowers and broccoli have also been hit over the past few years, all while ['back-up' imports from other countries have been failing](#) due to climate impacts abroad.

Amber Sawyer, analyst at the Energy & Climate Intelligence Unit (ECIU), said:

"Last year, the UK [had](#) its third-worst arable harvest on record, and [England its second worst](#), following extreme rainfall that scientists [said](#) was made about 10 times more likely and 20% more intense by climate change.

"But it's not just that. British farmers have been yo-yoing between extremes for the past few years. They've gone from having to contend with extreme heat in 2022, when temperatures [reached](#) 40°C for the first time, to [extreme rain in late 2023 and early 2024](#), both of which ruined their crops. Fast forward to now, and they've just [faced](#) the warmest spring since records began and the sixth driest. For them, climate change isn't a distant warning: it's a reality they're living every day.

"These extremes are also hitting consumers. In the UK, climate change [added](#) £360 to the average household food bill across 2022 and 2023 alone. We've seen much more extreme weather since then."

The world [has currently warmed](#) by an average of about 1.3°C above pre-industrial levels, but analysis by the UN [has found](#) that the current trajectory is for around 3°C of warming, which it says will be 'debilitating.

2023. the [hottest year ever recorded](#), was then [overtaken](#) by 2024. As early as December last year, experts at BSC, WMO and Met Office [predicted](#) that 2025 will be one of the top three hottest years alongside them.

While the 2023/24 El Niño likely played a role in amplifying these extremes, their increased frequency and intensity is in line with the expected and observed effects of human-induced climate change.

The research was conducted by an interdisciplinary team from the Barcelona Supercomputing Center, Potsdam Institute for Climate Impact Research, Catalan Institution for Research and Advanced Studies (ICREA), the Energy & Climate Intelligence Unit (ECIU), European Central Bank (ECB), University of Aberdeen and the Food Foundation.

Reference: Kotz, M., Donat, M. G., Lancaster, T., Parker, M., Smith, P., Taylor, A., & Vetter, S. H. (2025). Climate extremes, food price spikes, and their wider societal risks. *Environmental Research Letters*, 20(8), 081001. <https://doi.org/10.1088/1748-9326/ade45f>

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